*Unassigned, but suggested: Problems 3,6,8 in Section 7.2*

## 13.1 Problem 7.2.1

Prove Proposition 7.2.8 which says the following:

Let $(X, d)$ be a metric space.

(i) $\emptyset$ and $X$ are closed in $X$.

(ii) If $\{E_\lambda\}_{\lambda \in I}$ is an arbitrary collection of closed sets, then

$$\bigcap_{\lambda \in I} E_\lambda$$

is also closed. That is, intersection of closed sets is closed.

(iii) If $E_1, E_2, \ldots, E_k$ are closed then

$$\bigcup_{j=1}^{k} E_j$$

is also closed. That is, finite union of closed sets is closed.

Hint: consider the complements of the sets and apply Proposition 7.2.6.

*Solution.* □

## 13.2 Problem 7.2.2

Finish the proof of Proposition 7.2.9 by proving that $C(x, \delta)$ is closed.

*Solution.* □

## 13.3 Problem 7.2.7

a) Show that $E$ is closed if and only if $\partial E \subset E$. b) Show that $U$ is open if and only if $\partial U \cap U = \emptyset$.

*Solution.* □